WATER QUALITY OF YELLOWSTONE COUNTY

Ground Water

A total of sixteen ground water samples were collected from eight different wells in Yellowstone County (see attached map for locations) as part of the MDA 2005 Yellowstone River Valley Project. Of these eight wells four were permanent monitoring wells maintained by the MDA for the purpose of testing ground water for pesticides and four of the wells were private domestic wells. All of the wells were shallow (<30 feet) and were located down gradient of irrigated crop land areas. Pesticide and nitrate detections for these wells are summarized in the table below. The most commonly detected pesticide in the ground water of Yellowstone County was atrazine and atrazine metabolites along with several detections of imazapyr, bentazon, and a single detection of nicosulfuron. All of the pesticide concentrations were low and none exceeded drinking water standards. Elevated nitrate concentrations were commonly found and four of the ground water samples from two of the wells contained nitrate concentrations above the drinking water standard of 10 mg/L.

Summary of Pesticide/Nitrate Detections in Shallow Ground Water along the Yellowstone River, Yellowstone County, 2005 – Collected by the Montana Department of Agriculture

Well I.D.	Date	Nitrate (mg/L)	Nitrite (mg/L)	Atrazine + metabolites (µg/L)	Imazapyr (µg/L)	Nicosulfuron (µg/L)	Bentazon (µg/L)
Y-6	6/14/2005	6.9	ND	0.4	ND	ND	ND
	8/16/2005	7.4	ND	0.5	ND	ND	ND
Y-5	6/14/2005	1.1	ND	0.13	0.19	ND	ND
	8/16/2005	2.8	0.15	0.18	0.17	ND	ND
YCP-10	5/04/2005	15.0	ND	ND	0.12	ND	0.63
	7/20/2005	17.0	ND	ND	ND	ND	0.77
YCP-11	5/04/2005	3.3	ND	ND	ND	ND	ND
	7/20/2005	2.3	ND	ND	ND	ND	ND
YCP-9	5/04/2005	ND	ND	ND	ND	ND	ND
	7/20/2005	ND	ND	ND	ND	ND	ND
Y-2	6/14/2005	13.0	ND	0.61	ND	0.06	ND
	8/15/2005	10.0	ND	0.57	ND	ND	ND
YCP-8	5/04/2005	ND	ND	ND	ND	ND	ND
	7/20/2005	ND	ND	ND	ND	ND	ND
Y-3	6/14/2005	4.1	ND	0.04	ND	ND	ND
	8/15/2005	5.4	ND	0.23	ND	ND	ND
YCP-7	5/04/2005	ND	ND	ND	ND	ND	ND
	7/20/2005	ND	ND	ND	ND	ND	ND
YCP-6	5/03/2005	1.0	ND	ND	ND	ND	ND
	7/19/2005	ND	ND	ND	ND	ND	ND
YCP-5	5/03/2005	8.4	ND	ND	ND	ND	ND
	7/19/2005	7.3	ND	ND	ND	ND	ND
Drinking Water Standard		10	1	3	21,000	8,750	200

mg/L = milligrams per liter; µg/L = micrograms per liter; ND = not detected above analytical method reporting limit

There are numerous public water supplies which obtain their water from shallow alluvial ground water along the Yellowstone River in Yellowstone County. Some of these public water supplies are required to periodically test their water for various constituents including pesticides and nitrate. None of these public water supplies have had a pesticide detection for the period 2000 to the present. Nitrate was commonly detected in almost all these public water supplies but concentrations were generally low (1-4 mg/L). However, many of these public water supplies have sporadic elevated nitrate concentrations in the 4-9 mg/L range and a couple were exceeding the drinking water standard of 10 mg/L.

Surface Water

During 1999 the U.S. Geological Survey (USGS) collected 13 samples from the Yellowstone River near Billings in Yellowstone County and analyzed them for pesticides. The most commonly detected pesticides were atrazine and triallate (see table below). There were also single detections of carbofuran, metolachlor, prometon, and simazine. All these pesticides, with the exception of carbofuran and prometon, are commonly used herbicides in corn, sugar beet, and small grain crops. Carbufuran is an insecticide used in many of the crops common to the Yellowstone Valley. Prometon, which is a nonselective herbicide used in non-agricultural settings, and is commonly used and detected in urban areas (Barbash and Resek, 1996). All of the pesticide concentrations were low and none of the concentrations exceeded any human health standards or aquatic life standards where such standards exist. It is important to note that many of the herbicides used for noxious weed control (2,4-D, picloram, and imazapyr, to name a few) were not analyzed for during the USGS monitoring effort, so the impacts of these control measures on the Yellowstone River remain unclear.

Between 1999 and September 2001 the USGS collected 38 samples from the Yellowstone River near Billings and analyzed them for nitrate. Nitrate was detected in 35 of the 38 samples at concentrations ranging from 0.04-0.52 mg/L with a median concentration of 0.15 mg/L. Nitrate concentrations showed a seasonal variation with higher concentrations occurring between October and March and lower concentrations occurring during the April to September time frame (Miller et al, 2004). These seasonal variations are believed to be due to a lack of algal activity which consumes nitrate during the winter as well as decreased dilution due to low stream flows during the winter.

Summary of Pesticide* Detections in the Yellowstone River near Billings during 1999 and Nitrate Detections between 1999 and September 2001 - Collected by the U.S. Geological Survey

Pesticide Compound	Number of Samples Collected	Number of Samples with Pesticide Detected	Percent of Samples with Pesticide Detected	Minimum Concentration (μg/L)	Maximum Concentration (μg/L)	Drinking Water Standard (μg/L)	Aquatic Life Standard (μg/L)
Atrazine	13	5	38.5	E 0.003	0.008	3	1.80
Carbofuran	13	1	7.7	--	E 0.013	40	1.80
Metolachor	13	1	7.7	--	E 0.004	100	7.80
Prometon	13	1	7.7	--	M	100	--
Simazine	13	1	7.7	--	E 0.003	4	10
Triallate	13	3	23.1	E 0.002	0.004	--	0.24

Nutrient Compound	Number of Samples Collected	Number of Samples with Nitrate Detected	Percent of Samples with Nitrate Detected	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)	Drinking Water Standard (mg/L)	Aquatic Life Standard (mg/L)
Nitrate + Nitrite	38	35	92.1	0.04	0.52	10	--

E = Estimated value M = Presence of chemical verified but not quantified
* This table only contains a summary of pesticides detected; many other pesticides were analyzed for and not detected

There are several public water supplies, such as the City of Billings and the City of Laurel, which obtain their water from the Yellowstone River in Yellowstone County. These public water supplies are required to periodically test for pesticides and nitrates. Neither of these water suppliers have had a detection of pesticides for the period from 2000 to the present and both have consistent low levels of nitrate (<1 mg/L). However, it should be noted that analytical method detection limits for pesticides tested by public water supply laboratories are much higher then the detection limits for the USGS analytical method. The pesticides detected during the USGS monitoring effort were below the detection limits for the analytical method used by the public water supplies.

Barbash, J.E., and Resek, E.A., 1996, Pesticides in ground water – Distribution, Trends, and Governing Factors: Chelsea, Michigan, Ann Arbor Press, Pesticides in the Hydrologic System series, v. 2, 588 p.

Miller, K.A., Clark, M.L., and Wright, P.R., 2004, Water Quality Assessment of the Yellowstone River Basin, Montana and Wyoming – Water Quality of Fixed Sites, 1999-2001, U.S. Geological Survey Scientific Investigation Report 2004-5113.